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The Impact of Diet and Nutrition on Adolescent Depression: A Systematic Review

by

Rachel Samuelson, B.A.

MSW Clinical Research Paper

Presented to the Faculty of the

School of Social Work

St. Catherine University and the University of St. Thomas

St. Paul, Minnesota

In Partial Fulfillment of the Requirements for the Degree of

Master of Social Work

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The Clinical Research Project is a graduation requirement for MSW students at St. Catherine University/University of St. Thomas School of Social Work in St. Paul, Minnesota and is conducted within a nine-month time frame to demonstrate facility with basic social research methods. Students must independently conceptualize a research problem, formulate a research design that is approved by a research committee and the University Institutional Review Board, implement the project, and publicly present the findings of the study. This project is neither a Master's thesis nor a dissertation

Abstract

Depression in adolescence is linked with a range of adverse outcomes and substantial risk for morbidity and mortality across the lifespan. Improvement in diet and nutrition may offer an inexpensive and acceptable alternative to standard depression treatment. However, to this date, alternative treatment has been widely overlooked, due to lack of evidence and knowledge. This is crucial, as understanding and promoting the role of diet and nutrition in mental health could significantly reduce the impact of depression in young people. This systematic review sets out to examine the current literature on diet, nutrition, and adolescent mental health, in particular, the impact of diet and nutrition could have in the prevention and management of adolescent depression.

Keywords: adolescence, adolescent, depression, nutrition

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Introduction

The impact of diet and nutrition in the development of adolescent depression has been a focus of research over the past several years. Data from the adult populations have indicated that better diet quality is associated with better mental health outcomes (Jacka et al., 2013). An inverse relationship also has been confirmed between healthy diets and depression. A consistent diet of western foods such as red meat and processed foods are associated with a greater likelihood or risk of depression (Jacka et al., 2013).

The understanding of these associations in the adolescent population remains unclear. To date, much of the research has been surrounding behavioral outcomes of dietary intake or strict diet. The relationship between diet, nutrition and adolescent depression has been given little to no attention. There have been several studies regarding the impact of diet and nutrition on adult mental health disorders such as anxiety and depression, so it is imperative we do the same within the adolescent population (Oddy et al., 2009).

Adolescence is a time of growth and change. Diet and nutrition are particularly important during this period. By observing and understanding how diet and nutrition play a part in an individual's physical and mental health, modifications can be made to significantly better one's quality of life.

This systematic review is set to examine the impact of diet and nutrition on adolescent depression. This paper will discuss common variables that occurred within the literature regarding this topic as well as an application using the Ecological model on micro, meso, and macro levels.

Background

Depression is a serious public health concern. The prevalence rate is high and increases the risk of suicide, and it diminishes the quality of life (Harrington, 2003). Fifteen million people in the United States have been diagnosed with major depression, and an additional 15 million people will experience milder forms of depression at some point in their lifetime (Harrington, 2003). This disorder affects individuals of all ages. Many believe that children and adolescents are unable to be diagnosed with these disorders, but adolescents suffer from anxiety and depression at alarming rates (World Health Organization, 2016). In the United States, adolescents aged 13-19 years old suffer from major depressive disorder at a rate of 11.7% (Merikangas, He, Burstein et al., 2010). Along with anxiety, depression is one of the largest contributors to mental health disorders in adolescents.

Currently, the best practice for the treatment of depression includes psychotherapy and psychopharmacological interventions (Martinsen, 2008). However, the mind-body connection is a growing area of research and interest for those in the health profession as it relates to the symptomatology of depression (Martinsen, 2008). There is limited awareness, acceptance, and evidence that diet and nutrition could play an impactful role in the prevention and management of depression. With growing interest, research is starting to suggest that appropriate diet and nutritional interventions could significantly reduce the personal and social effects of depression (Bamber et al., 2007).

There is research suggesting a relationship between dietary nutrition and mental health (Bamber et al., 2007; Tomlinson et al., 2009; Fulkerson et al., 2004; Weng et al., 2011; Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Oddy et al., 2009; Jacka et al., 2011; Kulkarni et al., 2015; Jacka et al., 2013). However, while many readily understand the

connection between diet and nutrition deficiencies and physical illness, not many understand the relationship between diet and mental health (Oddy et.al, 2009). Unfortunately, most of the evidence surrounding the association between diet, nutrition, and depression come from studies in adults and tend to focus on specific nutrients and supplementation.

This lack of understanding of diet, nutrition, and mental health rings especially true in the case of adolescents (Oddy et al., 2009). A correlation was found between negative mental health outcomes and a western dietary pattern that includes red meats, processed foods, takeout, sugary and refined foods (O'Neil et al., 2014). Better mental health outcomes were found in those with a dietary intake of fresh fruit and vegetables. These results show that a proper diet can play a vital role in the onset as well as the severity and duration of depression (O'Neil et al., 2014).

Depression

In numerous countries, depression is one of the most common mental health disorders. Around 350 million people suffer from depression worldwide, and this number has increased dramatically in recent years (World Health Organization, 2016). Currently, one out of ten individuals suffer from major depression, and almost one out of five has suffered from this disorder at some point in their lifetime (World Health Organization, 2016). By 2020, the World Health Organization (2016) estimates that depression will be the second-leading cause of world disability and by 2030, it is expected to be the largest contributor to disease (World Health Organization, 2016).

Depression is typically thought of as a strictly biochemically-based or emotionally rooted disorder (Merikangas, He, Burstein et al., 2010). Depression is a psychiatric disorder with the defining feature being a change from pleasant to unpleasant moods (American Psychiatric

Association, 2013). For the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) diagnosis of Major Depressive Disorder, five or more symptoms must have been present for at least two weeks. These symptoms include depressed mood, loss of interest or pleasures, weight loss/gain, insomnia or hypersomnia, psychomotor agitation, feelings of worthlessness, diminished ability to concentrate, and recurrent thoughts of death or self-harm (American Psychiatric Association, 2013). It is important to establish whether these symptoms have been accounted for due to the differentiation between depression and normal mood fluctuations and short responses to challenges in everyday life. It is also important to establish an understanding of the individual's mood to make sure the direct effects of the behavior are not due to substance use, a medical condition, or a recent death of someone close in their life. Any of these may reduce the likelihood of reliable and valid mental status assessment. The duration of a depressive episode can range from 2 weeks to several years. Episodes may also differ in their severity from mild, indicating only a modest deviation from normal functioning, to severe, involving an inability to care for oneself and requiring intensive care (American Psychiatric Association, 2013).

Mild depression typically presents with difficulty continuing everyday work and social activities, but individuals will probably not cease to function entirely. Severe depression is likely to impair life to the full extent in many areas such as social, occupational, and vocational functioning. Individuals will be very unlikely to continue social engagements, work, activities or hobbies due to their symptoms. Mild disorders present with the minimal number of symptoms, moderate disorders present with six or seven symptoms, and severe with eight symptoms or more (Harrington, 2003).

Adolescent Depression

Specifically, adolescent depression is increasing at an alarming rate (Backman et. al, 2002). In 2015, an estimated 3 million adolescents in the United States had at least one major depressive episode in the past year. This number represented 12.5% of the U.S. population aged 12 to 17 (Kaminski & Garber, 2002). Lifetime prevalence rates of depression in adolescents are estimated to range from 15% to 20% compared to adult lifetime rates (Kaminski & Garber, 2002).

The DSM-5 criteria for Major Depressive Disorder are similar for adults, adolescents, and children. However, depression in adolescence may present differently than it does in adulthood (American Psychiatric Association, 2013). There is longitudinal evidence from a study (birth-26 years old) that suggests that child and adolescent onset of depression may be distinguished from the adult onset of depression by childhood risk factors (Merikangas et. al, 2010). Some of these factors include developmental deficits, family dysfunction, instability, psychopathology, criminality in the biological family, and inhibited or uncontrolled temperaments in childhood (Milin, Walker & Chow, 2003). Early onset of depression has been shown to predict future depressive episodes throughout the lifespan (Milin, Walker & Chow, 2003; Yagnik, McCormick, Ahmad, Schecter, & Harris, 2014).

Depression in adolescence is typically long in duration with a high risk of relapse. Several studies have shown the mean length of a depressive episode to be 6 to 9 months (Milin, Walker & Chow, 2003). The longer the duration of the depressed episode, the greater likelihood of it persisting and recurring. However, in a study of adolescents where the depressive episodes were brief in nature, the substantial risk of reoccurrence still existed.

In a clinical sample of adolescents, the median duration of depression ranged from 12 to 16 weeks (Milin, Walker & Chow, 2003). This duration may be more representative, compared to previous studies because it was unaffected by methodological variables and extreme scores on both sides. In a study of high-risk adolescents, episode durations were consistent with prior community studies and generally shorter than those reported in clinical samples. A greater adolescent impairment was associated with longer episode duration of both major and minor depression (Kaminski & Garber, 2002).

Adolescent depression is a persistent and common mental health disorder that has several personal and social costs. These costs include self-harm, substance use, declining academic performance, and suicidality (Harrington, 2003). Clearly, depression in adolescence represents a major public health concern. Treating adolescent depression remains a major public health challenge (Harrington, 2003) and there is a pressing need to identify strategies for its prevention and management.

Adolescent Dietary and Nutritional Practices

A diet with proper nutrition can play a major role in the onset, severity, and duration of depression (O'Neil et al., 2014). To date, there have been many studies that tended to focus on the association between intakes of specific nutrients and adults with depression and schizophrenia. These studies have shown that individuals who are depressed had low nutritional levels in these areas and that supplementation leads to improvement in symptoms (O'Neil et al., 2014). This has resulted in growing interest to research the adolescent population and the association of diet, nutrition and what it takes to maintain good mental health.

Adolescence is a time of biological and psychosocial change. During adolescence, rapid growth occurs, with half of the adult weight gained and most of the peak bone mass accumulated during this time. This dramatic physical growth increases an adolescent's energy, protein, vitamin, and mineral needs (Bamber et al., 2007). Typically, adolescent diets are characterized by health-compromising eating patterns such as skipping meals, dieting inappropriately, and relying on sugar-sweetened beverages, fast foods, and energy-dense snacks (Bamber et al., 2007). Most adolescents consume diets that are too high in fats, cholesterol, sodium and sugar. In contrast, they are too low in fruits and vegetables (Carlson et al., 2001). In a study done by Youth Risk Behavior Surveillance System, it was found that only 22.3% of youth met the recommendations for fruit and vegetable intake (Center for Disease Control and Prevention, 2009). This recommendation ranges from 1-2 cups of fruit and 1-3 cups of vegetables. Fruit and vegetable consumption decreased by an average of 0.6 servings per day between middle to late adolescence among both boys and girls (Center for Disease Control and Prevention, 2009).

In a National Opinion Poll, adolescents reported consuming higher quantities of less healthy food and lower intakes of healthy food. This diet includes fast food instead of fruits and high-fat/sugary snacks instead of meals made from scratch (Mental Health Foundation, 2006). Given most adolescents eat unhealthy diets, it is important to understand why and how to intervene before these eating patterns put them at increased risk for eating disorders, obesity, and chronic diseases such as type II diabetes and heart disease (Jacka et al., 2010). Adolescence is, therefore, a critical period for both diet and nutritional education to establish healthy eating patterns and reduce disease risk (Backman et al., 2002).

The Link between Depression, Diet, and Nutrition

There is a suggested link between diet, nutrition, and depression (Bamber et al., 2007, Tomlinson et al., 2009; Fulkerson et al., 2004; Weng et al., 2011; Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Oddy et al., 2009; Jacka et al., 2011; Kulkarni et al., 2015; Jacka et al., 2013). Studies suggest that the increased incidence of mental health problems over recent years may be related to the change in dietary patterns over the same time frame, with a shift from whole foods to a more refined and processed diet (Bottomley & McKeown, 2008). Greenstone (2007) state that twentieth-century food consumption patterns changed dramatically. The total dietary fat intake increased from 32% of calories in 1909 to 43% by the end of the century. Carbohydrate intake dropped from 57 to 46% while protein has remained stable at 11% of consumption in the American population.

Also, the advent of convenience foods across the span on of the century, the use of caffeine as well as processed and refined foods, which have little or no nutritional value, can exacerbate anxiety and depression (Greenstone, 2007). Processed and refined foods suppress the activity of a key growth hormone in the brain called brain-derived neurotrophic factor (BDNF). It also triggers a cascade of chemical reactions in the body that promotes chronic inflammation which disrupts the normal functioning of the immune system and brain (Greenstone, 2007).

Specific nutrients such as fatty acids and B vitamins are crucial to combating these mental health issues. Previous research explored the association of nutrients including Vitamin B5, Folate, Vitamin B12 and Omega-3 fatty acids and their relationship with a variety of different mental illnesses (Kiecolt-Glaser, Belury, Porter et al. 2007). The studies suggest that lower levels of these nutrients correlate with negative mental health problems. The lower levels of vitamin B6, vitamin B12 and Folate may affect mental health through their involvement in

methylation reactions to produce serotonin and other monoamine neurotransmitters (Kiecolt-Glaser, Belury, Porter et al. 2007). Omega-3 fatty acids are crucial components of the structure of the central nervous system and their surrounding membranes. They are involved in serotonin transport, which may explain their relationship with mental health disorders (Kiecolt-Glaser, Belury, Porter et al. 2007).

Serotonin is a vital chemical neurotransmitter in the body. It relays signals between nerve cells and regulating their intensity. It influences brain cells both directly and indirectly. Low levels of serotonin are associated with depression. About 80 to 90 percent of the human body's total serotonin is found in specialized cells in our guts (Kiecolt-Glaser, Belury, Porter et al. 2007).

Depressive feelings and dietary patterns are often cyclical. When individuals feel depressed, the brain indicates the need for increased dopamine or serotonin, and when feelings of depression occur for individuals, the immediate burst of relief provided by sugar reinforces the behavior, which leads to a cycle of craving and depression (Martinsen, 2008). The sugar activates a release of insulin, a hormone which mops up sugar molecules and transports them out of the blood and into cells. The more sugar circulating in the body, the more insulin your body needs to produce (Martinsen, 2008). When serotonin levels are high, nervous tensions arise, along with confusion, drowsiness, low mood, lack of willpower and poor appetite control. Often, individuals choose foods that lend immediate gratification from feelings of lethargy and sadness but do not provide long-term solutions (Martinsen, 2008).

Westover and Marangell (2002) investigated the relationship between sugar consumption and major depression. Using information from the Cross-National Epidemiology of Major Depression and Bipolar Disorder Study and sugar consumption data from the United Nations,

they discovered a significant relationship between sugar consumption and the annual rate of depression. Westover and Marangell state that there is a reason to believe, from this data, that sugar consumption may directly impact the prevalence of depression (Westover & Marangell, 2002)

While looking specifically at depression, one can also look at the imbalance between Omega-3 fatty acids and Omega-6 fatty acids. This imbalance has been linked to an increase in depression (Kiecolt-Glaser et al. 2007). The change in the Western diet may be to blame due to the growing consumption of the Omega-6 fatty acids in comparison to Omega-3 fatty acids (Kiecolt-Glaser et al. 2007). A healthy diet contains a balance of Omega-3 and Omega-6 fatty acids. However, Omega-3 fatty acids help reduce inflammation, and some Omega-6 fatty acids tend to promote inflammation (Kiecolt-Glaser et al. 2007).

However, looking only at the nutritional piece to explain the relationship between diet and mental health may be misleading. If one only looks at specific nutrients, that does not explain the whole picture. By only looking at the nutrient analysis of an individual's diet, one ignores the synergistic effects between nutrients consumed (Kim et al., 2003). It is more important to examine the overall diet of an individual because no one consumes isolated nutrients (Kim et al., 2003).

Using Diet and Nutrition to Treat Depression

Changing a person's diet to include healthier and more nutritious food choices can be challenging. Encouraging, celebrating and modeling healthy cooking and eating behaviors could be beneficial especially when adolescents transition into being an adult. By having family meals together, adolescents are more likely to consume healthier food (Oddy et al., 2009). Adolescents

who consume fewer family meals consume more unhealthy food. Increased family meal frequency may decrease risk of overweight or obesity in children and adolescents and protect against eating disorders and negative health behaviors in adolescents and young adults. Lastly, creating a ritual within a family whether that be within cultural capacity or the ritual aspect of having a family meal provides a setting for parents to encourage healthful behaviors in their families (Oddy et al., 2009). By putting in the extra effort to plan and cook healthy, nutritious meals, adolescents can make smart food choices that will help them build healthy habits have a positive impact on their physical and mental health (Oddy et al., 2009).

In conjunction with current interventions, dietary and nutritional approaches have been proposed and suggested to treat depression. However, this may prove difficult. Johnson (2010) states that mainstream medical and mental health professionals treat the symptoms with a medical-based approach which focus on studies of effective pharmaceuticals. In his article, Johnson (2010) states there are several alternative ways to treating depression, including a nutritional and dietary approach. However, the most commonly used interventions continue to be anti-depressants.

Although we are aware of the alternative ways of treating depression, there have not been many empirical studies done to examine the nutritional correlations between adolescents and depressive symptoms (Soh, Walter, Baur & Collins, 2009). While the media and science journalists have created hypotheses about hormones in the food we consume, Johnson stressed the importance of scientific nutritional studies. These few studies have determined that blood concentration of folate and B12 exhibit decreased depression symptoms in adolescents (Johnson, 2010; Soh, Walter, Baur & Collins, 2009)

Johnson (2010) also noted another study that found the role of omega-3 fatty acids in depression has been seen in depressed individuals having low levels of the fatty acid in their red blood cell membranes. Johnson (2010) mentioned that researchers reviewing the association between low levels of omega-3 fatty acids and depression for the American Psychiatric Association (APA) were impressed enough with the evidence to recommend that adolescents with a depressive disorder take at least one gram of omega-3 supplements per day (Johnson, 2010).

Currently, however, antidepressants are the number one prescribed drug on the market for depression in the United States (World Health Organization, 2016). The effectiveness and safety of antidepressants prescribed to children and adolescents have come under critical review, with neither proven in some studies. Contributing factors towards depression in youth such as diet, exercise, stress, sleep patterns, family, friends, cognitive factors, socioeconomic status and medical issues need to be the underlying foundation of a clinician's knowledge of how to employ appropriate and efficient treatments (Tomlinson, Wilkinson, & Wilkinson, 2009).

The good news is that proper diet can play a role in the prevention and management of these depressive symptoms. I engaged in the analysis of data using the ecological perspective as a guiding framework to answer the question, how does diet and nutrition impact adolescent depression.

Conceptual Framework

The conceptual framework regarding a research study is the focused perspective, the structure of assumptions, principles, and rules that hold together the ideas encompassing a broad

concept. A conceptual framework is defined as “products of qualitative processes of theorization; to explore the process of building conceptual frameworks” (Jabareen, 2009, p. 50).

The ecological framework provided the conceptual framework for this systematic review because of the different lens it allows and its broad application to health objectives. The ecological framework originally consisted of four systems: 1) micro, 2) meso, 3), exo and 4) macro. However, there was recently a fifth system proposed: chrono, which references time. (DePoy & Gilson, 2012). Bronfenbrenner's ecological framework was first introduced in the 1970's as a conceptual model and became a theoretical model in the 1980's. In his original theory, Bronfenbrenner hypothesized that to understand human development, the entire system in which growth occurs needs to be examined. The ecological framework is explained as a systems phenomenon which blurs boundaries between systems and developmental theories (DePoy & Gilson, 2012).

The microsystem is defined as the immediate surroundings of the individual. These include things such as family, home, work and school. The mezzo system is described as a set of microsystems such as communities or neighborhoods; the exo system is described as the systems that indirectly influence an individual such as a mother's workplace or a sister's school. The macro system is described as the abstract system which guides and shapes systems such as the economy, cultures, and policy; and lastly, the chrono system is the system of time and history (DePoy & Gilson, 2012). The fifth system allows a view of the ecological framework as it changes within the history and the span of life (DePoy & Gilson, 2012). The ecological framework is a combination of time measured by an individual's chronological aging as well as the chronological movement within the systems (DePoy & Gilson, 2012). For this systematic review, only micro, mezzo, and macro levels will be analyzed and demonstrated.

From an ecological perspective, micro is described as the individual and the immediate surroundings of a person such as a family, home, work or school (DePoy & Gilson, 2012).

According to this perspective, taste preferences, lack of nutrition knowledge and skills can be barriers to a healthful diet (DePoy & Gilson, 2012). Low nutritional knowledge and inadequate cooking skills have been reported as barriers to fruit and vegetable intake which influences adolescents to choose unhealthy food options (Bamber et al., 2007).

Adolescents tend to understand nutrition and their intake of food in relationship to their parent's nutrition knowledge and food intake (Jacka et al., 2013). They also tend to associate healthy foods with parents and fast food with pleasure, friendship and socializing and expect negative reactions if they choose a healthier food option (Oddy et al., 2009).

From an ecological perspective, mezzo is described as microsystems such as neighborhoods and communities (DePoy & Gilson, 2012) and include intermediate systems such as schools and religious communities. This perspective looks at the underlying reasons individuals may have been experiencing healthy or unhealthy dietary habits by looking at food availability, access to healthy food and workplace food environments.

The last system in the ecological perspective is the macro system. The macro system involved local, state, and federal policies. Several policies influence food, food prices, food quality and food intake patterns. Foods that are less-nutrient-dense and of lower cost are reported to be the food choice of many individuals (Monsivais & Drewnowski, 2007). A strong determinant of food choices is the price which is why individuals choose less nutritious food (Monsivais & Drewnowski, 2007).

Methods

Research Purpose

The purpose of this systematic literature review is to explore the question: How does Diet and Nutrition Impact Adolescent Depression?

For the purpose of this study, several of the key terms that will be discussed include adolescent OR adolescence, nutrition, diet, and depression. According to the World Health Organization (2016), *adolescence* is a period of development and growth that occurs in between childhood and adulthood, from ages 10-19. This is a critical transition period in the life span characterized by tremendous growth and change, second only to infancy stage of development. Whereas, *adolescent* refers to an individual who is between the ages of 10-19 years old (World Health Organization, 2016). *Diet* refers to the sum of food or drinks a person consumes. There are many different variations of diets including vegetarian, gluten-free, and diets for people with certain health problems (World Health Organization, 2016). *Nutrition* refers to the intake of food about the body's dietary needs. There are good and bad nutrition practices. Good nutrition is a well-balanced diet combined with regular physical activity. Whereas, poor nutrition leads to impaired emotional, physical and mental development, reduced immunity and a greater susceptibility to disease (Bamber, Stokes, and Stephen, 2007). *Depression* refers to a disorder associated with symptoms such as depressed mood, increased sadness and anxiety, loss or gain of appetite, and a loss of interest in pleasurable activities (Milin, Walker & Chow, 2003).

Types of studies

In order to answer the question of how an adolescent's diet and nutrition affect their depression, the researcher analyzed several different studies. These studies included literature

reviews, meta-analyses, empirically based, qualitative, and quantitative studies. Focus groups, descriptive studies, and case reports were taken into consideration.

Levels of Publication

This study will include full-text, peer-reviewed literature. Few research institutions have been involved in studying the impacts of diet and nutrition on an adolescent's depression.

Search Strategy: Sensitivity and Specificity

The purpose of a systematic literature review is to be authoritative on a topic and to have the audience receive all relevant research within specified parameters. In order to understand the relevant research around the research question, sensitivity and specificity searches were conducted. A sensitivity search will retrieve a high number of studies, including both relevant and irrelevant studies. A specificity search will be more focused on all of the aspects of the topic and retrieve a smaller number of studies. These studies will be highly specific to the topic, but the search will likely miss other relevant studies due to its narrower lens (Petticrew & Roberts, 2006).

Using sensitivity as well as specificity searches helps to understand the literature landscape to narrow down search terms, as well as develop inclusion and exclusion criteria. Both searches for sensitivity and specificity were performed as part of this study.

Research Design

This research presented a systematic literature review process and did not involve human subjects. The University of St. Thomas International Review Board approval and Protection of Human subjects do not apply. The process of this literature review involved finding and vetting

existing literature that addressed the research question and synthesizes the findings of those research articles.

Review Protocol

Studies considered for inclusion in this review (1) were full-text articles, (2) consisted of peer-review and scholarly literature reviews, and (3) were available after the year 2000. The literature review process involved finding and vetting existing literature that addresses the research question and synthesizing findings. This search of academic journals and electronic bibliographic databases included: EBSCOhost databases: Academic Search Premiere, PsycNet, and PubMed. The articles were searched and collected during January of 2016. These data qualifications were put in place as a means of addressing the validity for this research.

Table 1: Database Results for Articles

Database	Search results	Included articles
PsycNET	27	4
EBSCOhost- Academic Search Premiere	24	4
PubMed	75	3

Data Analysis

Inclusion Criteria

In the databases of EBSCOhost- Academic Search Premiere, PsycNet, and PubMed full-text searches were carried out using the following combination of search terms: “adolescent” OR “adolescence” AND “nutrition” AND “diet” OR “eating habits” OR “food habits” AND “depression.” All the articles that came up in these databases, using these terms, and were published after 2000. In EBSCOhost- Academic Search Premiere, 33 peer-reviewed articles

satisfied the specified search criteria. In a search of PsycNet, 27 peer-reviewed articles were produced, and lastly, in search of PubMed, 75 peer-reviewed articles were produced. A search was also performed on JSTOR and SocINDEX using the same research terms. However, this search produced no new articles.

Exclusion Criteria

Out of the 135 articles that met the initial inclusion criteria, only 11 met criteria to be included in this literature review. Articles excluded from the research review included: studies that examined individual nutrients or supplements; studies that focused on eating disorders or disordered eating; articles that examined emotional or binge eating, articles that focused on depression from obesity; articles that reviewed the effects of preservatives on mental health, and articles that focused on overall mental health. Articles were excluded if they did not fit the criterion of the age range of adolescence. Selected articles were also limited to those written in the English language.

Decisions on inclusion and exclusion were based on the title and abstract of the articles. See Table 2 for a complete list of included articles.

Table 2: Included Articles

Database	Title	Author(s)
PsycNET	Depressive Symptoms and Adolescent Eating and Health Behaviors: A Multifaceted View in a Population-based Sample	Jayne A. Fulkerson, Nancy E. Sherwood, Cheryl L. Perry, Dianne Neumark-Sztainer, and Mary Story (2004)
	Diet and Mental Health in Children	Diane Tomlinson, Heather Wilkinson and Paul Wilkinson (2009)

	Lifestyle Factors and Adolescent Depressive Symptomatology: Associations and Effect Sizes of Diet, Physical Activity, and Sedentary behavior	Joshua Hayward, Felice N Jacka, Helen Skouteris, Lynne Millar, Claudia Strugnell, Boyd A Swinburn, and Steven Allender (2016)
	A Prospective Study of Diet Quality and Mental Health in Adolescents	Felice N. Jacka, Peter J. Kremer ³ , Michael Berk, Andrea M. de Silva-Sanigorski, Marjorie Moodie, Eva R. Leslie, Julie A. Pasco, Boyd A. Swinburn (2011)
EBSCOhost- Academic Search Premiere	The Role of Diet in the Prevention and Management of Adolescent Depression	D.J. Bamber, C.S. Stokes, and A.M. Stephen (2007)
	Associations between Diet Quality and Depressed Mood in Adolescents: Results from the Australian Healthy Neighbourhoods Study	Felice N. Jacka, Peter J. Kremer, Eva R. Leslie, Michael Berk, George C. Patton, John W. Toumbourou, and Joanne W. Williams (2010)
	The Cross-Sectional Association between Diet Quality and Depressive Symptomology amongst Fijian Adolescents	Rachael Sinclair, Lynne Millar, Steven Allender, Wendy Snowdon, Gade Waqa, Felice Jacka, Marj Moodie, Solveig Petersen, Boyd Swinburn (2016)
	Diet Quality and Mental Health Problems in Adolescents from East London: A Prospective Study	Felice N. Jacka, Catherine Rothon, Stephanie Taylor, Michael Berk, and Stephen A. Stansfeld (2013)
PubMed	The Association between Dietary Patterns and Mental Health in Early Adolescence	Wendy H. Oddy, Monique Robinson, Gina L. Ambrosini, Therese A. O'Sullivan, Nicholas H. de Klerk, Lawrence J. Beilin, Sven R. Silburn, Stephen R. Zubrick, Fiona J. Stanley (2009)
	The Associations between Diet Quality and Mental Health in Socially Disadvantaged New Zealand Adolescents	A.A. Kulkarni, B.A. Swinburn and J. Utter (2015)

	Is There any Relationship between Dietary Patterns and Depression and Anxiety in Chinese Adolescents?	TT Weng, JH Hao, QW Qian, H Cao, JL Fu, Y Sun, L Huang, FB Tao (2011)
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Summary of Included Articles

Fulkerson et al. (2004) surveyed 4,734 ethnically diverse, middle and high school students in Minneapolis, MN on their depressive symptoms, eating and health behaviors. Depressive symptoms were positively associated with compromising attitudes such as perceived barriers to healthy eating and weight concerns and negatively associated with behaviors such as eating breakfast, lunch, and dinner. However, associations between depressive symptoms and dietary nutrients were not statistically significant. Adolescents who reported depressive symptoms were at risk for other health-compromising attitudes and behaviors and were less likely to engage in health-promoting behaviors. Depressive symptoms may be the underlying trait in the expression of healthy behaviors among adolescents. However, they did not appear to be related to inadequate nutritional intake in this study.

Tomlinson, Wilkinson & Wilkinson (2009) This review looked the role of diet in mental health and its increasing interest to the public. It examined the literature assessing the role of diet in childhood cognitive development, school performance and behavior. Inadequate dietary intake and its effects were considered. The focus was on children and adolescents, and the impact diet can play in diagnoses such as depression and psychosis were discussed.

Hayward et al. (2016) examined the associations between adolescent diet, physical activity, screen time behaviors, and depressive symptomatology. Using a cross-sectional sample of students in 8th-10th grade, 3,295 participants were recruited from 18 different schools.

Participants completed a self-reported questionnaire comprising the Mood and Feelings Questionnaire. Results showed an increase of unhealthy dietary patterns were associated with depressive symptomatology in males and overall, gender-specific associations were observed between physical activity and both sedentary and dietary behaviors and depressed symptomatology among adolescents.

Jacka et al. (2011) studied 3,040 Australian adolescents aged 11-18 on their dietary habits and mental health. Self-report and anthropometric data collected this data. The study cross-sectionally measured both healthy and unhealthy diets and gauged emotional health on the Pediatric Quality of Life Inventory (PedsQL). The higher scores on the PedsQL meant better mental health. The study also presented that the healthier diet scores at baseline predicted higher PedsQL scores while higher unhealthy diet scores at baseline predicted lower PedsQL. Simply put, improvements in diet quality were mirrored with improvements in mental health while unhealthy diet quality was associated with poor mental health functioning.

Bamber, Stokes, & Stephen (2007) reviewed the role of diet in the prevention and management of adolescent depression. They took a closer look at the examination between dietary improvement and specific supplementation for a potentially inexpensive, safe and acceptable intervention for treatment for depression. Bamber (2007) states that there is emerging evidence for an association between low dietary intakes and unhealthy eating habits with the occurrence of emotional and behavioral disorders. However, there is more research needed on specific disorders and the adolescent population.

Jacka et al. (2010) studied whether diet quality is also related to depression in adolescents by examining 7,114 adolescents, aged 10-14 years old. Healthy and unhealthy diet scores were derived from the Australian Healthy Neighborhoods study, and the Short Mood and Feelings

Questionnaire measured adolescent depression. Results demonstrated the association between diet quality and adolescent depression that exists over and above confounding factors.

Sinclair et al. (2016) examined the relationship between diet quality and depressive symptomology amongst a community-based sample of 7,237 Fijian adolescents. Questionnaires measuring diet quality were dispersed and dietary variable was coded into two unique and independent factors, healthy diet quality and unhealthy diet quality. Depressive symptomology was assessed via the emotional subscale of the PedQL. Both measures were self-reported and self-administered. Multiple linear regression was used to test cross-sectional associations (at baseline and follow-up) between diet quality and depressive symptomology. Strong associations between healthy diet and low depressive symptoms were found in a cross-sectional analysis. No association between emotional health and unhealthy diet were found.

Jacka et al. (2013) set out to examine the relationship between diet quality and depression in a varied ethnic and cultural adolescent populations. In this prospective cohort study, 3,000 adolescents from East London were assessed on their dietary and mental health status, using a Dietary questionnaire, a strengths and difficulties questionnaire and a short mood and feelings questionnaire. In the cross-sectional analysis, evidence was found supporting the association between an unhealthy diet and mental health problems.

Oddy et al. (2009) investigated the association between dietary patterns and mental health in early adolescence by using a prospective study of 2,900 pregnancies recruited during 1989 and 1992. It wasn't until 14-years-old, these individuals were assessed on their behavior and their dietary habits. Two dietary patterns were identified using factor analysis and food group intakes estimated by a 212-item food questionnaire. The results concluded that higher intake of a Western diet, more takeaway foods, red meat or confectionary foods had significant associations

with poorer behavioral outcomes. Improved behavioral scores were significantly associated with higher intakes of leafy green vegetables and fresh fruits.

Kulkarni, Swinburn & Utter (2015) examined the relationship between diet quality and mental health in an ethnically diverse adolescent population in New Zealand. A qualitative study was conducted by using a cross-sectional, population-based study design. Respondents self-reported and were assessed on their dietary habits, healthy and unhealthy eating, and mental health was evaluated on the emotional scale, the Pediatric Quality of Life Inventory (PedsQL) instrument. Findings concluded that eating a healthy diet was significantly associated with better emotional health and eating an unhealthy diet was significantly associated with greater emotional distress.

Weng et al., (2011) conducted a quantitative study to determine the association between major dietary patterns characterized by factor analysis and the risk of depression and anxiety symptoms among adolescents. Students attending junior high school were assessed cross-sectionally by a self-reported FFQ which consisted of thirty-eight items regarding diet and symptoms of depression and anxiety. The study consisted of 5,003 adolescents, 11-16 years of age. Factor analysis identified three major dietary patterns, specifically snack, animal food, and traditional dietary patterns. A relationship was demonstrated between major dietary patterns and mental disorders, and results suggest that high consumption of unhealthy diets, rich in energy-dense foods but nutrient-poor foods is associated with increased risk of depression and anxiety.

Research Findings

The purpose of this systematic literature review was to explore the question: How does diet and nutrition impact adolescent depression? While researching using the databases of EBSCOhost, PsycNET, PubMed and within the inclusion and exclusion criteria described

above, 11 peer-reviewed articles met criteria. Of the 11 articles included in this study, all of them (100%) explored the use of diet and nutritional quality as an exposure variable. Of those studies, six (55%) explored the relationship between dietary patterns and depression and five (45%) explored the nutritional quality and depression.

More than half of the research included in this review (81%, n=9) contained self-reported data by the participants. Of the 81% of articles, one was prospective cohort study, and eight were cross-sectional design studies. The other two studies in this review were reviews of the literature on diet and depression.

Most the articles included in this systematic review (90%, n=10) were based in countries outside of the United States. All the articles included (n=11) contained both boys and girls of adolescent age (i.e. 13-17) and 55% (n=6) discussed how boys are at a greater risk for poor diet quality than girls because they typically consumed more processed snacks and take away meals from home.

Two of the studies involved in this systematic review (18%, n=2) involved ethnically, and culturally diverse adolescent populations and one included a socioeconomically diverse and disadvantaged adolescent population, and seven of the 11 articles (64%) discussed the socioeconomic status and its effect on your diet and nutrition quality.

All 11 articles in this systematic review (100%) showed the association between diet quality and depressive symptoms and the role of diet and nutrition help yield in the depressive symptoms.

Application of the Ecological Systems Framework

The goal of this study is to examine the existing literature on whether diet and nutrition can impact adolescent depression. Through the analysis of these 11 articles, themes emerged regarding how diet and nutrition can impact adolescent depression. These themes have been categorized using the conceptual framework of the ecological perspective. Within the levels of micro, meso, and macro, themes will be discussed. The ecological framework provided the conceptual framework for this systematic review because of the different lens it allows and its broad application to health objectives (DePoy & Gilson, 2012).

The Microsystem

The microsystem is described as the central level of the system which encloses the individual. (DePoy & Gilson, 2012). The interaction with objects and people in their intimate and immediate world. The individual's microsystem includes parents, siblings, friends, partners, and others in very dynamic and active engagements and interactions (DePoy & Gilson, 2012). Per this perspective, influence on eating behaviors and dietary and nutritional intakes were themes that play a role in adolescent's life and depressive symptoms.

Influence on eating behaviors

Many of the studies discussed in the literature followed the theme of influence. This influence looked at influences of dietary or nutritional intakes or influences from family or peer groups. In terms of macronutrients, the influence of both fat and carbohydrate on brain function may have implications for mental health. As well as certain fatty acids, vitamins and minerals are thought to influence mood (Bamber et al., 2007; Jacka et al., 2011; Tomlinson et al., 2009; Jacka

et al., 2010; Weng et al., 2011; Oddy et al., 2009). Lastly, nutrients may be effective as an antidepressant medication (Bamber et al., 2007; Tomlinson et al., 2009).

Another influence on an adolescent's life are the patterns of dietary behaviors, including social interactions at meal times and eating location, may have important implications in an adolescent's mental health (Bamber et al., 2007; Kulkarni et al., 2015). Studies suggest that adolescents eating an evening meal with their families have more healthful dietary patterns than adolescents who do not, including higher intakes of fruits, vegetables, and dairy foods. However, if adolescents are not eating meals with their family, they may be obtaining food from fast food restaurants or eating while watching television or playing video games (Oddy et al., 2009).

Adolescents tend to understand nutrition and their intake of food in relationship to their parent's nutrition knowledge and food intake (Jacka et al., 2011; Bamber et al., 2007; Jacka et al., 2010). Parents shape the way adolescent's view and understand their relationship with diet and nutrition. They tend to associate healthy foods with parents and fast food with pleasure, friendship and socializing. Adolescents tend to expect negative reactions if they choose a healthier food option while out socializing with friends (Jacka et al., 2011; Bamber et al., 2007; Fulkerson et al., 2004).

Health-promoting attitudes such as caring about eating healthy food and staying fit were significantly negatively associated with depressive symptoms. On the other hand, health compromising attitudes regarding perceived barriers of convenience and food preference to healthy eating were significantly positively associated with depressive symptoms among men and women (Oddy et al., 2009; Hayward et al., 2016; Jacka et al., 2010).

Adolescents are often concerned with physical appearance, body weight and shape and food choices may be associated with unhealthy weight control behaviors, which is also related to depression. Conversely, the concern about looks may be associated with healthy food choices as well (Jacka et al., 2010; Jacka et al., 2011).

The concern about looks may be why we see gender also influencing diet and nutrition. Boys are at a greater risk for poor diet quality than girls (Bamber et al., 2007; Jacka et al., 2010; Fulkerson, 2004; Jacka et al., 2011). The positive association among males between unhealthy dietary patterns and depressive symptomatology was consistent with other findings (Jacka et al., 2010, 2011; Oddy et al., 2009). However, in a study done by Weng et al., (2011) girls consumed more snack foods than boys. The findings are also supported by previous conclusions that females were ambivalent towards eating snacks, perceiving snacks as unhealthy, but preferred to eat especially under stress (Jacka et al., 2010)

Dietary and Nutritional Quality

Adolescents' experience many forms of dietary intake and these are generally divided into categories such as 'unhealthy' and 'healthy.' In these studies, 'unhealthy' is typically categorized by consuming takeaway foods for dinner, snack foods, soft drinks, sugary foods, and processed foods. Whereas, a healthy diet quality relates to the availability of fruit and vegetables at home, servings of fruits and vegetables, and consuming fruit drinks (Sinclair et al., 2016; Kulkarni et al., 2015; Weng et al., 2011; Hayward et al., 2016).

Types of food and adolescent taste preference were frequently coded when discussing healthy and unhealthy foods. Adolescents prefer fast food, ready meals, takeaway food and high-fat/sugar snacks in comparison to fruits, vegetables and meals made from scratch (Sinclair et al.,

2016, Bamber et al., 2007, Fulkerson et al., 2004, Hayward et al., 2016). Preferences for sweets, carbohydrates or fat and rich snack foods may enhance mood which may continue an individual's want for those types of choices (Oddy et al., 2009; Weng et al., 2011; Hayward et al., 2016).

Adherence to the Western dietary pattern was associated with poorer mental health. Western and unhealthy were used interchangeably. The Western diet consists of more red meat, fast food, lower nutrient dense food, and sugary snack foods (Oddy et al., 2009; Weng et al., 2011; Sinclair et al., 2016; Kulkarni et al., 2015).

Lower intake of nutrient-dense food and overall unhealthy diet quality are related to an increase in the likelihood of an adolescent being depressed (Weng et al., 2011; Jacka et al., 2010; Bamber et al., 2007; Fulkerson et al., 2004; Jacka et al., 2013; Oddy et al., 2009; Sinclair et al., 2016; Jacka et al., 2011; Kulkarni et al., 2015). Unhealthy diet quality is lacking nutrient-dense foods which may lead to nutrient deficiencies which have been associated with mental health issues. Dietary intake may also have an impact on the biological system. However, both intake of healthy food and decreased intake of unhealthy food may positively influence one's depression, but an increase in one behavior is not indicative of a decrease in the other (Jacka et al., 2010; Jacka et al., 2011; Kulkarni et al., 2015).

Only one study out of the twelve in this study found no association between healthy dietary patterns and depressive symptomatology which is inconsistent with many findings (Hayward et al., 2016). This study only looked at healthy dietary factor as fruits and vegetables and the intake of items such as fish, nuts, and whole grains. Other studies with scores comprising more items did show the inverse relationships between healthy dietary patterns and depression.

Although data suggests that diet and nutrition are related to depression in adolescents, there was not a clear message as for how it would act as a treatment for depression. Most of the research has been conducted in adults rather than adolescents, so no recommendation for standard treatment can be given but rather how diet and nutrition can play a therapeutic role in depression (Tomlison et al., 2009; Bamber et al., 2007).

The Mesosystem

This system includes various systems that serve the individual in the microsystem, formally and informally. These systems include institutions, socio-economic status, religious institutions (church, temple, mosque, etc.), school, clubs, the office, work, and volunteer organizations. This perspective looks at the underlying reasons individuals may have been experiencing healthy or unhealthy dietary habits by looking at socio-economic status and culture (DePoy & Gilson, 2012).

Socioeconomic Status

Several studies have suggested a link between socioeconomic status and mental health disorders (Jacka et al., 2010, Sinclair et al., 2016; Oddy et al., 2009; Jacka et al., 2013; Hayward et al., 2016; Fulkerson et al., 2004; Jacka et al., 2011). Socioeconomic status has also been shown to influence the quality of one's diet. Evidence suggests that an increased income allows for the purchase of foods with higher nutritional value (Fulkerson et al., 2004, Oddy et al., 2009). Therefore, adolescents from families with lower socioeconomic status have less access to nutritious foods and are limited to local restaurants and stores for cheap, unhealthy food which is classically categorized by food that is high in calories, fat, and sodium (Bamber et al., 2007; Fulkerson et al., 2004; Weng et al., 2011; Fulkerson et al., 2004; Jacka et al., 2011).

Multiple studies presented data that showed diet quality following a socio-economic incline. When higher quality diets are associated with greater affluence, unhealthy diets that are nutrient-poor are typically consumed by persons of a lower socioeconomic status and of more limited economic means. Healthy foods such as whole grains, lean meats, fish, dairy products, fresh fruits, and vegetables are more likely to be consumed by persons belonging to a higher socioeconomic class (Tomlinson et al., 2009; Hayward et al., 2016; Jacka et al., 2011). In contrast, the consumption of refined grains and added fats has been associated with lower socioeconomic status (Tomlinson et al., 2009; Hayward et al., 2016; Jacka et al., 2011; Oddy et al., 2009; Jacka et al., 2013).

The association between socioeconomic status and diet quality can be explained by a variety of potential causalities; access to food, quality of food and cost of food. Access to healthy food options is difficult while looking in neighborhoods and communities with limited food availability. Limited food availability is characterized in several ways, a clear lack of food, the presence of fewer stores carrying healthier foods and more fast food restaurants (Fulkerson et al., 2004; Jacka et al., 2010; Weng et al., 2011). This typically is the case in poorer neighborhoods, and this does not allow individuals to live a healthier lifestyle. The lower socioeconomic status will lead someone to have less access to quality food which will, in turn, cause them to eat low-cost, unhealthy food. If higher socioeconomic status, an individual may have a better, healthier diet due to access and means (Weng et al., 2011; Jacka et al., 2010; Fulkerson et al., 2004; Jacka et al., 2013; Tomlinson et al., 2009; Hayward et al., 2016; Jacka et al., 2011).

Culture

Although culture was not blatantly discussed within the research articles, this theme is apparent throughout by looking at where the research studies on this topic have taken place. Nine

out of eleven of the research studies in this systematic literature review have taken place from around the world. These countries include: Fiji, Australia (4), New Zealand, The United Kingdom, and China (Weng et al., 2011; Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Oddy et al., 2009; Jacka et al., 2011; Kulkarni et al., 2015; Jacka et al., 2013).

Studies from these countries have shown adolescent populations experiencing fewer depressive symptoms while eating a healthy diet and have started to address the global issue that the food industry has profoundly changed how and what we eat (Weng et al., 2011, Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Oddy et al., 2009; Jacka et al., 2011; Kulkarni et al., 2015; Jacka et al., 2013)

The Macrosystem

This covers the larger society and culture in which individual lives and interacts. The Macrosystem plays a ubiquitous role including in developing and industrialized countries. The macro system involves local, state, and federal policies. Several policies influence food, food prices, food quality and food intake patterns. These macro issues include research studies, policy initiatives and the promotion of diet and nutrition as a potential to aid mental health symptoms in adolescents and reduce the burden of depression within communities (DePoy & Gilson, 2012).

All eleven of the studies in this systematic review discuss the potential for further studies to create larger policy incentives within schools and communities. If more longitudinal studies can confirm the association that diet and nutrition impact depression, the potential exists for the development for more evidence-based research to be created and policies to be implemented. This primary prevention of adolescent depression could be as simple as a dietary modification. These modifications could align with public health initiatives and strategies aimed at reducing the impact of childhood and adolescent mental health issues as well as dietary and nutritional

problems such as eating disorders and obesity (Bamber et al., 2007; Tomlinson et al., 2009; Fulkerson et al., 2004; Weng et al., 2011; Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Oddy et al., 2009; Jacka et al., 2011; Kulkarni et al., 2015; Jacka et al., 2013).

There is an urgent need for alternative supports for adolescents with depression. Waiting lists for treatment and mental health beds are long, and waiting lists could be diminished if schools, communities, and care providers were equipped with the knowledge that health-focused programs could help. Dietary and nutritional strategies could play a crucial role in the well-being of adolescents (Fulkerson et al., 2004; Bamber et al., 2007; Jacka et al., 2011; Tomlinson et al., 2009; Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Kulkarni et al., 2015).

However, dietary and nutritional strategies are not currently used in mainstream therapy. Although the research is limited and there are clear deficits in the current evidence base, diet and nutrition are recognized as a potential treatment option for depression (Fulkerson et al., 2004; Weng et al., 2011; Sinclair et al., 2016; Hayward et al., 2016; Jacka et al., 2010; Oddy et al., 2009; Jacka et al., 2011; Kulkarni et al., 2015; Jacka et al., 2013).

Discussion

The aim of this systematic review was to answer the question how does diet and nutrition impact adolescent depression. This review was set up using inclusion and exclusion criteria, as well as both sensitivity and specificity searches, as a means of finding relevant and current research. The research that emerged from this review was consistent with associations made between unhealthy dietary patterns and depressive symptoms in adolescence.

Adolescent's food preferences include fast food, ready meals, takeaway food and high-fat/sugary snacks in comparison to fruits, vegetables and meals made from scratch (Sinclair et al., 2016; Bamber et al., 2007; Fulkerson et al., 2004; Hayward et al., 2016). However, intakes

of lower nutrient-dense foods and unhealthy dietary choices are related to an increase in depressive symptoms in adolescents.

This dietary problem may be due to an individual's choice, socioeconomic status or access to food, or availability of healthy food choices in the local schools and surrounding community. However, there are numerous potential pathways by which diet and nutritional quality may have an impact on depression. The influences in an adolescent's life such as social interaction around mealtime, eating location and eating meals with families support healthy dietary habits. Adolescent's parents play a significant role in the understanding and comprehension of diet and nutritional intake. Parents shape the way adolescent's view and understand nutrition, so promotion of healthy habits early is essential for a proper diet later in life.

Socioeconomic status may play a huge part in why an adolescent may not be getting their nutritional and dietary needs met. There is a strong, inverse association between socioeconomic status and weight (Oddy et al., 2009). The cost of healthy foods such as fruits and vegetables is higher than less nutritious sugary food (Fulkerson et al., 2004).

Nearly half of those living in low-income areas are also living in food deserts. Within food deserts, there is access to food at places such as fast food restaurants and small convenience stores but mostly in the form of low-quality options like chips, cookies, processed meats and boxed food (French et al., 2001). While fast food and processed food is inexpensive, most low-income families suffer from food insecurity, meaning they are not able to access enough nutritionally adequate and safe food to have a healthy, active life (French et al., 2001).

It is difficult to be mentally and physically healthy if you are unable to consume quality foods. Consistent consumption of low-quality foods containing high amounts of sugar, sodium, and fats result in low brain development, increased anxiety and depression, increased risk of diabetes, disease, and obesity (O'Neil et al., 2014) A change needs to be made for a healthier, more transparent food system. The availability of quality, minimally processed, organic, non-GMO foods needs to be accessible for individuals of all socioeconomic levels in order for everyone to have access to lead a healthy lifestyle (Tomlinson et al., 2009).

Dietary and nutritional improvements offer the potential for inexpensive, safe and acceptable interventions and treatment for adolescent depression as well as supporting healthy upbringing and well-being of adolescents. However, it is not clear what characteristics of depression such as severity and duration are associated with the dietary and nutritional intervention.

This systematic review suggests that diet and nutrition have the potential to play a crucial role in these community-based health promotion initiatives. Unfortunately, the potentially important role of diet in mental wellbeing remains under-recognized, perhaps owing to a lack of awareness of the research evidence, or skepticism surrounding diet as capable of influencing mood and behavior.

The Role of Social Work

These variables were important to note because as social workers will see patients from differing age ranges, cultural and ethnic backgrounds, and socioeconomic statuses. One common factor shared across all people of these demographics is food. How, what, and where we eat affects our minds and needs to be part of the holistic treatment. The literature suggested that we

collaborate as professionals with physicians, dietitians, counselors, social workers, as well as caregivers who may prepare food for those unable to do so for themselves.

It is ultimately up to the professional what they subscribe to as viable treatments or treatment supplementations, but education is always the first step in formulating one's beliefs on treatment and taking a stance on these questions and issues (Bamber, Stokes, and Stephen, 2007).

As social workers, we have the ability to impact individuals on multiple levels of practice. On the micro level, we can engage in counseling and case management with individuals, families, and groups. While we are with our clients, it is important to model positive food behaviors and promote healthy eating choices with still giving our clients the autonomy to make their own decisions. We can gauge our client's diet and nutritional needs in the intake assessment to see what can be improved. The assessment items can explore the clients' access to nutritious food, amounts of food and meals eaten daily, consumption of fresh fruits and vegetables, and intake of vitamins and supplements.

On the meso level, social workers can promote healthy food options at schools and within the community. They can shine a light on the unhealthy food choices being offered and try to advocate for more choices and availability of non-processed foods. They may also advocate and join social justice initiatives such as ending local food deserts, promoting community gardens, and encouraging local stores to donate available food to banks and shelters.

On the macro level, social workers can advocate for food security programs as well as promote policies and innovations that will eliminate barriers to eating and maintaining a healthy diet. The promotion and creation of opportunities for healthy behaviors can help protect a population against future physical and mental health illnesses.

Limitations

While this review was intended to cover all relevant pieces of research on the topic of diet and nutrition and how it impacts adolescent depression, there were still limitations to this study. First, the articles were limited in data from adolescent populations. Many of the articles related to the relationship between diet and depression focus on adult populations, so there is very little data to inform interventions for adolescents. However, it is important to remember that policy and practice within diet and nutrition for this population could help influence future generations within mental health, obesity, and several other co-occurring disorders.

The research was limited to articles that were peer-reviewed and published in the English language. This was done to ensure the validity of the research, but it may have left out non-scholarly articles on the topic. Lastly, only three of the 11 articles were from the Western half of the world which leaves out a perspective which may be imperative for future research.

Suggestions for Future Research

There continues to be emerging evidence for the association between diet, nutrition, and depression. However, more research needs to be done in regards to specific variables and with more adolescent populations. In a majority of the studies within this systematic review, the duration and severity of the depression were not clear. The features of the depression would allow for a proper understanding and response of how the dietary and nutritional intervention worked.

Second, there is little known about this diet and nutrition in regards to the adolescent population. More research needs to be done using this population. More so, about longitudinal relations between diet, nutrition and adolescent depression. Longitudinal studies can provide

further insight into the direction of the relationship as well as provide support for intervention studies to assess whether improving an adolescent's dietary and nutritional habits also improve their depression.

Lastly, there is a strong push for alternative and complementary treatments to mainstream interventions for mental health disorders. In order for diet and nutritional interventions to be employed, randomized control trials and studies are needed to provide accurate information on the safety and efficacy.

With a stronger evidence base and further investigation, it will be possible to influence research data into policy practices and support intervention programs. With dietary and nutritional intervention aimed at mental health promotion and prevention in mainstream therapeutic practices, there is a promise of a happier and healthier young population in the future.

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